Is Africa Integrating? Evidence from Product Markets

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Abstract

Integration into the global trading environment is viewed as a key factor underlying the success of the fastest growing economies. Yet many African countries remain isolated and appear to have failed to achieve the level integration of these fast growing economies. This paper presents a price-based assessment of product market integration in Africa using disaggregated retail prices for over 200 products and 13 African cities. Product market integration is first assessed using absolute and relative measures of price dispersion. This followed by an econometric analysis to identify some of the domestic, regional and global factors that have contributed towards product market integration in Africa. Overall, we find evidence of increased product market integration in Africa. The volatility of real exchange rates between African countries has fallen over the past two and a half decades. Product price dispersion at the retail level amongst the sample of African cities also fell, although much of the decline was concentrated in North Africa during the early 1990s. The econometric estimates reveal that trade costs, as proxied by distance and MFN tariffs, are the dominant determinant of price dispersion amongst the African cities. External forces also matter. Global trends in price dispersion contributed around 29 percent of the overall increase in integration.

KEY WORDS: Product market integration, Retail prices, African regional integration, Price dispersion, Law of one price, Economist Intelligence Unit city price data.

1 Introduction

Integration into the regional and global trading environment is viewed as a key factor underlying the success of the fastest growing economies. Yet many

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African countries remain isolated and appear to have failed to achieve the level integration of these fast growing economies. Sub-Saharan Africa's (SSA) share of world trade volumes, for example, fell in the post 2000 period, reflecting a continuation of the dramatic decline experienced during the second half of the 20^{th} century (Amjadi and Yeats, 1995 and Amjadi et al., 1996).[1] Indicators of the trading environment (the World Bank Trading on Time indicators and Logistic Performance Indices and the World Economic Forum Enabling Trade Indices) place most SSA countries at the lower end of the rankings.

The general diagnosis is that African economies remain segmented, despite various trade policy reforms and regional trade agreements entered into. Yet, the empirical research underpinning this assessment is based almost entirely on the degree to which countries trade with each other (i.e. a quantity based measure of integration) conditional on their various characteristics (e.g. the standard gravity model analysis).[2] This is problematic as trade volumes are not only an endogenous outcome of policies to enhance market integration, but are also strongly influenced by unrelated factors including government expenditure, exchange rates and donor funding.

An arguably better measure of integration is the degree to which price levels in the various countries are similar and/or the extent to which they co-move or converge. In a well-integrated and well-functioning market, price differences, after accounting for transport costs, should be arbitraged away through intra-regional trade. Changes in product market integration will therefore be reflected in prices, whether or not trade occurs, as it is the potential for arbitrage that determines how far prices can diverge (Parsley and Wei, 2002: 2). Price-based analyses of product market integration are increasingly applied to industrialized countries (Engel and Rogers 1996; Crucini et al., 2005a, 2005b; Bergin and Glick, 2007), but are limited in developing countries such as in Africa where the requisite data are often unavailable.

This paper extends this literature with a descriptive analysis of product market integration in Africa using price data. The primary aim is to establish the extent to which price levels and price changes have converged between African countries or cities since the mid-1980s. The emphasis is on the integration of regional product markets, although the paper also explores the extent to which integration into the world economy through multilateral trade reform and global price trends may account for the observed trends in regional price integration. The focus is not on the integration of policies such as monetary or fiscal policy, although these can be expected to have profound effects on the integration of product markets.

The analysis is conducted using three approaches. A macro perspective of

[1] Sub-Saharan Africa's share of nominal world exports rose from 1.9 to 3 percent from 200 to 2008, but this increase reflects price increases associated with the commodity price boom. The share of SSA in world export volumes fell from 1.9 percent to 1.6 percent over the same period. Estimates are based on World Development Indicator data using a sample of 99 countries (37 from SSA).

[2] See Foroutan and Pritchett (1993), Elbadawi (2001), Portugal-Perez and Wilson (2009) and Freund and Nadia (2010).

price integration using aggregate consumer price indices is first presented. This is followed by a product level analysis of market integration using retail prices from 1990 for over 200 products and 13 African cities (4 from SADC, 5 from rest of SSA, 4 from North Africa). The data are obtained from the Economist Intelligence Unit (EIU). Finally, we identify some of the internal, regional and global factors that have contributed towards product market integration in Africa using gravity-style estimates.

There are clear limitations in each analysis, but together they provide supporting evidence that product markets in Africa have become more regionally integrated. Bilateral real exchange rates across African countries have become less volatile over the past two and half decades. Retail product prices converged across selected African cities, although most of the decline took place in the 1990s and was concentrated in North Africa. There are many potential determinants of this integration including trade policy, macroeconomic policy and global forces external to these economies. We do not explore all of these factors, but our gravity-style estimates reveal that trade costs, as proxied by distance and MFN tariffs, are key determinant of price dispersion amongst the African cities. External forces also matter. Global trends in price dispersion contributed around 29 percent of the overall increase in integration.

The paper is organized as follows. Section 2 presents the basic conceptual framework behind the analysis of product market integration and reviews some existing empirical research on Africa. This is followed in Section 3 by the analysis of product market integration using the retail price data for selected African cities. Section 4 presents various estimates of the determinants of price dispersion within the sample of African cities, and Section 5 concludes the paper.

2 Product market integration: Conceptual frameworks and existing research

The basic building block behind the analysis of price integration is the law of one price (LOP) that states that for any good i:

$$P_i = EP_i^* \tag{1}$$

where P_i is the domestic currency price, E is the home currency price of foreign currency and P^* is the foreign-currency price. The law of one price therefore states that the prices of equivalent goods converted into the same currency should be sold for the same price in different countries. Clearly, LOP is a theoretical benchmark as product prices are influenced by a multitude of factors such as transport costs, trade barriers, market power and services costs (Rogoff, 1996). Nevertheless, deviations from this benchmark provide one metric to evaluate the degree to which product markets are integrated within a region or within a country.

Empirical analysis of the LOP is widespread, but the approaches pursued vary enormously. A common approach in the purchasing power parity (PPP)

literature is to compare national price levels. The assumption in this case is that goods market arbitrage enforces parity in prices across a sufficiently broad range of products to ensure a high correlation in aggregate price levels (Rogoff, 1996). In most cases, aggregate price level data are not available, so the PPP relationship is analyzed using price indices.[3] Because price indices give no indication of the level of prices, these studies focus on *relative* PPP, defined as

$$d\ln(P)_t = d\ln(E)_t + d\ln(P^*)_t \tag{2}$$

where P and $P*$ reflect aggregate price indices and the subscript t refers to time. Relative PPP therefore requires that the rate of growth in domestic prices be equal to the rate of growth of foreign prices converted into the home currency. If markets are integrated, we would expect that relative PPP would hold in the long-run.

Within Africa, various tests for long-run relative PPP using aggregate level data have been conducted (Nagayasu, 2002; Bahmani-Oskooee and Gelan, 2006; Chang et al., 2006; Holmes, 2000). The empirical research includes individual country level studies and tests of cointegration within panels of African countries. The results are mixed and are sensitive to the time period and estimation technique used (as is found in other international studies - see Rogoff, 1996).[4]

In general, however, there is support for increased price integration within SSA. Table 1, for example, reports the average real exchange rate volatility for various groupings of African countries in two periods: 1985-96 and 1997-2008. The volatility of the real exchange rate between country j and k ($qvol_{jk}$) is measured as the standard deviation of the first difference of the log of the real exchange rate over a particular period:

$$qvol_{jk} = sd_t(\Delta\ln(CPI_j \ / \ e_{jk}CPI_k))$$

where CPI is the price index and e_{jk} is the bilateral exchange rate. The volatility indicator is constructed using annual data. Both the average within-region (between members) volatility and between-region (i.e. between members and non-members) real exchange rate volatility is presented. Following Engel and Rogers (1996) improved product market integration is revealed by a decline in the volatility of the real exchange rate.

As revealed in the table, the average volatility of the bilateral real exchange rates between SSA countries declined over the two periods (0.25 to 0.17). This can largely attributed to a decline in the real exchange rate volatility between

[3] See Chen, Choi and Devereux (2008) who use indicators of aggregate price levels.

[4] Bahmani-Oskooee and Gelan (2006) find support for PPP using real effective exchange rates in 11 out of 21 African nations. Chang et al. (2006) test for PPP using use a dynamic non-linear unit root test and find that PPP holds true for six countries, namely the Central African Republic, the Côte d'Ivoire, Kenya, Madagascar, Uganda and Lesotho. Holmes (2000) tests for long-run relative purchasing power parity among a sample of 27 African less developed countries using quarterly data covering the period 1974-97. He generally rejects PPP using individual country unit root tests but finds support using a t-bar test. Finally, Nagayasu (2002) applies panel cointegration techniques to 17 African countries and finds support for the weak-form of the long-run PPP hypothesis.

SSA members outside of SADC as there is hardly any change in the volatility between SADC members. The table also reveals strong co-movements in the bilateral real exchange rate within the South African Customs Union (SACU) and within the CFA Franc Zone. The low volatility levels can be attributed to the monetary unions within each grouping and are consistent with similar findings by Rose and Engel (2002) for currency unions more generally.[5] Finally, real exchange rate volatility has declined slightly in the various trade agreements (ECOWAS, COMESA, EAC), although whether the decline can be attributed to the agreements requires more thorough interrogation of the data.

While informative about aggregate price changes, the inferences one can draw about product market integration from the PPP studies and the aggregate price index data are severely constrained. The aggregate price indices do not necessarily cover standardized baskets of goods. Furthermore, price indices only enable the study of the *time series* distribution of international relative prices and provide little insight into the cross-sectional distribution of international relative prices (Crucini et al., 2005a). Unless PPP holds in the base year for all countries, deviations in relative price changes do not necessarily signify price convergence or divergence (Rogoff, 1996; Knetter and Slaughter, 2001). For example, relatively rapid growth in prices in one country is consistent with price convergence if prices were initially low or, alternatively, price divergence if prices were initially equal to or greater than the comparator countries.

An alternative approach is to use highly disaggregated product price data, as in Knetter and Slaughter (2001), Parsley and Wei (2002), Bergin and Glick (2007), Crucini et al. (2005a, 2005b) and others. Yet, the paucity of comparable microeconomic price data in African countries has limited the application of this approach to the region. In cases where microeconomic price data are available (as in the *Worldwide Cost of Living Survey* conducted by the Economist Intelligence Unit (EIU)), the African cities are subsumed into the broader sample of countries or cities used in the analysis (Parsley and Wei, 2002; Bergin and Glick, 2007). Price dispersion between the African cities is therefore not analyzed, although the results of Parsley and Wei (2002) indicate that price dispersion is significantly lower amongst members of the CFA Franc Zone.

An exception to the above is a recent study by Aker et al. (2009). They find a border effect for grains and cash crops between Niger and Nigeria, but an even more pronounced effect for an intra-national border in Niger that separates the Hausa and Zarma region. Their study therefore adds an additional dimension to product market integration which is likely to be of particular relevance to Africa, namely the segmentation of product markets by ethnicity of regions. There appears to be no comparable studies of price integration using microeconomic data in SADC countries. This paper, therefore, extends this field of research.

[5] Within SACU, South Africa, Namibia, Swaziland and Lesotho are part of a common monetary union.

3 Product market integration using retail product prices

To evaluate product market integration in Africa, we draw on disaggregated product prices obtained from the Economist Intelligence Unit (EIU) *Worldwide Cost of Living Survey*. This data has been used in similar studies focusing on the European Union and North America (Crucini et al., 2005a; Engel et al., 2003; Engel and Rogers, 2004; Bergin and Glick, 2006).

The survey records local prices from 1990 for over 160 individual goods and services in more than 120 cities worldwide. In many cases, prices are sampled from different retail outlets, e.g. supermarkets and mid-priced stores. Data are available for 14 cities in 13 African countries (Table 2). Nine of these cities (8 countries) are located in Sub-Saharan Africa (four cities of which are in SADC countries) with the remaining 5 located in North Africa. In our analysis, we focus only on traded goods and therefore exclude services.

There are a number of advantages in using this data.[6] As shown in the sample of data presented in Table 3, the product classification is narrowly defined (e.g. tea bags (25 bags)) thereby ensuring that the price comparisons are made across similar goods. For some products the brand is specified – Gilbey's gin, coca-cola, Kodak film. A relatively high proportion of the product prices cover food products, but prices are also available for clothing, household supplies and personal care items. Prices are defined according to the retail outlet (supermarkets, mid-price stores and others), which helps overcome price differences associated with the segmentation of consumer markets by retail outlets. Finally, the data are available over a reasonably long time period which also covers a period of liberalization and increased integration of trade flows.

Data limitations nevertheless remain. Although the product description is narrowly specified, it still covers a potentially wide range of products of different qualities. The price data in various cities are also at times characterized by unusual volatility both over time and across products. Harare and Tripoli are particularly problematic and will be dropped in much of the analysis. Further, prices are not collected for all the products and cities every year: prices are only available for the full 1990-2008 period for 11 of the 14 cities. Finally, the data are only available for a relatively dispersed set of African cities which precludes a comprehensive product-level analysis of price integration amongst the various African trade or monetary agreements (FTA, CU or Monetary unions) and the estimation of 'border effect' on price levels (as in Engel and Rogers (1996)). These caveats need to be recognized in analysis that follows.

Conceptual Framework

[6] A further advantage of using consumer price data are that theory on product market integration provides much tighter predictions on absolute and relative price movements of consumer products. In contrast, product market integration can be consistent with increasing and decreasing *producer* price dispersion. In a world characterised by production fragmentation, integration can change the activity composition of production. In response to greater specialisation by activity, industry level producer prices can actually become less similar (Knetter and Slaughter 2001).

To provide structure to the analysis of product market integration using retail prices, we use the conceptual framework developed by Engel and Rogers (1996) and Crucini et al. (2005a, 2005b).[7] Product prices sold by retailers are considered to be a function of both non-traded inputs and traded inputs:[8]

$$P_{i,j} = (P_j^N)^{\alpha_i}(P_{i,j}^T)^{(1-\alpha_i)} \tag{3}$$

where P denotes price in US dollars, i refers to the product, j to a particular country and the superscripts N and T to non-traded and traded, respectively. Retailers purchase traded inputs and add value through the addition of services. The log difference in retail prices of product i between countries j and k in year t can be expressed as:

$$\begin{aligned} q_{i,jk,t} &= \log(P_{i,j,t}/P_{i,k,t}) = \alpha_i \log(P_j^N/P_{k,t}^N) + (1-\alpha_i)\log(P_{i,j,t}^T/P_{i,k,t}^T) \quad (4) \\ &= \alpha_i q_{jk,t}^N + (1-\alpha_i) q_{i,jk,t}^T \end{aligned}$$

The insight from this equation is that price differences are a linear combination of differences in non-traded and traded input prices as well as differences in the production share attributable to each (represented by α).[9]

Differences in trade costs including tariff barriers in turn influence the relative price of traded inputs. Assuming, as in Crucini et al. (2005b), traded intermediate inputs satisfy the LOP up to a trade cost, the log deviation for the relative price of traded inputs between country k to j will reflect the trade costs associated with exporting or importing the inputs between the countries (or from third countries). For example, $q_{i,jk,t}^T$ is expected to be positive if country j imports product i from country k and negative if trade flows the other way.[10] If both are importers from a third country, then the effect on relative prices via trade inputs will depend on each country's transport costs from the third country.

This equation provides the basis for the subsequent analysis of price integration (see Crucini et al. (2005b) who explicitly derive various testable hypotheses). Two different indicators of price integration are used. The first

[7] Measurement of LOP deviations and changes in goods market integration using product level data include the mean square error of log price differences (Engel and Rogers, 2004; Bergin and Glick, 2007), the standard deviation of log price differences across goods (Parsley and Wei, 2002), the absolute value of the (log) differences in product prices (Engel et al. 2003) and the coefficient of variation of product prices across countries or the coefficient of variation in log price differences across products (Knetter and Slaughter, 2001). Crucini et al. (2005a, 2005b) also look at changes in the mean across products of the log price difference (not the mean of the absolute value as in Engel et al. (2003)) as well as the variation across products of price differences.

[8] Price dispersion is also influenced by other factors such as tastes and market structure (Knetter and Slaughter, 2001). These effects are ignored in this analysis.

[9] A further advantage of this specification is that it can account for the Balassa-Samuelson effect. Wealthier countries tend to have higher wages and hence higher non-traded prices. Hence relatively rapid productivity growth in the traded good sector of an economy relative to other countries will be associated with a decline in the country's real exchange rate.

[10] Let $(1+s_{i,jk,t})$ denote symmetric transport costs of trading input i between country j and k. The log deviation in retail prices can be expressed as: $q_{i,jk,t} = \alpha_i q_{jk,t}^N + (1-\alpha_i) I_{jk,t}^i \log(1+s_{i,jk,t})$ where $I_{jk,t}^i$ equals 1 if goods travel from k to j and – 1 if goods travel from j to k.

indicator measures *absolute* price dispersion and looks at the mean deviation from the law of one price (LOP). The second indicator measures the dispersion of *relative* prices across products i for country pairs jk.

Mean deviation from LOP

For a preliminary perspective of price differences in comparable retail outlets across cities, Figure 1 presents the average product price in each city relative to Johannesburg over the periods 1991-94, 1995-99, 2000-2004 and 2005-08. Relative prices are also included for Harare, but not Tripoli where price movements during the late 1990s are highly volatile.[11]

The figure reveals considerable differences in product prices across countries. Product prices in Abdijan, Dakar, Douala and Lagos were on average over 1.4 times the price in Johannesburg at various stages of 1990s. Product prices in Casablanca, Nairobi, Tunis and Lusaka are closer to those in Johannesburg, while those in Pretoria (from 2000) are almost identical. The similarity of prices between Pretoria and Johannesburg is consistent with other empirical evidence that finds lower variation in prices between cities in the same country than between cities in different countries (Engel and Rogers, 1996). Unfortunately, price data for multiple cities within other African countries are not available from the database.

There is also suggestive evidence of a convergence in product prices across the two periods. In most cities product prices converged on the Johannesburg price over the full period – see Harare, Dakar, Duoala, Nairobi and Abidjan, in particular. For all cities combined (excluding the post-2000 sample), the average product price relative to Johannesburg fell from 1.24 in the late 1990s to 1.07 in the late 2000s.

A more comprehensive assessment of product market integration is possible using Figure 2. This figure presents kernel density estimates of LOP deviations for each SSA city measured as the log price deviations from the geometric mean SSA city price

$$q_{i,j,t} = \log P_{i,j,t} - \sum\nolimits_{k=1}^{M} \log P_{i,k,t}/M \tag{5}$$

where M is the number of SSA cities. Each line therefore represents an estimate of the density of good-by-good deviations from the LOP. Figure A in the Appendix presents the equivalent figures using the sample of North African cities. In calculating the LOP deviations we only compare prices across similar retail outlets. Kernel density estimates are provided for four to five-year sub periods using the average LOP deviation for each period. The simple across product average of the deviation from LOP ($\mathrm{E}_i(q_{i,j,t}|j)$) for each city in each period is presented in Table 4.

A few key results features are evident. Firstly, deviations from the LOP are substantially smaller between Johannesburg and Pretoria (both in South Africa) than between cities in different countries. This is revealed by the very similar kernel density estimates for each city and is consistent with international

[11] For example, the price of products in Tripoli were on average three times those in Johannesburg during the 1990s and then fell to around 88 percent of the price in Johannesburg after 2000.

literature that finds greater price integration within countries than between countries. Secondly, there is a wide dispersion of deviations from the LOP. Deviations from the LOP for particular products can be in the order of ± 150 percent. One possible explanation is that the EIU price data is picking up vast differences in the quality of products sold in these cities. The deviations may also be indicative of relatively high transport and other trade barriers across these cities. In Section 4, we try to isolate some of these influences using estimates of a gravity-model.

A third observation is that the average deviation from LOP for each city differs vastly from zero. In 2008, for example, product prices in Harare were on average 49.8 percent lower than the average in SSA from 1995 to 1999 (Table 4). Retail prices were also lower on average in SA (-20 percent) and Nairobi (-14.4 percent). Retail prices were relatively high compared to the SSA average in Abidjan, Lagos, Duoala and Dakar in all the periods. The divergence from the regional average, however, is substantially lower for North African cities. The average product prices in North African cities did not deviate from the regional mean by more than 22 percent in all periods (Table 4). In all cases the average deviation from LOP are significantly larger than for the EU, where most countries fall within the interval ± 10 percent (Crucini, 2005a).

Finally, there is evidence of retail price convergence within the sample of SSA and North African cities. The distributions of LOP deviations shifted and became more centered around zero for all SSA cities apart from Lagos. The bulk of the convergence, however, for many of the cities (Harare, Duoala, Nairobi and Dakar) took place during the 1990s – see also Table 4. The exception to these trends is Lagos where the mean LOP deviation rose from 9.2 percent in 1991-94 to 26.7 percent in 2005-08. The trends for North African cities are broadly consistent with these (Table A in the Appendix).

Simple econometric estimates corroborate this finding. In Table 5, we present the coefficients from a regression of the *absolute value* of the LOP deviation at the product by outlet type level for each city (i.e. $|q_{i,j,t}|$) on a time trend and the square of the time trend. Product by outlet-type fixed effects are included so that the estimates are capturing the within-product by outlet changes in deviation from the regional average price.

The average retail product price converged to its regional mean in all cities other than Lagos, although the path of convergence differed across cities. For cities for which data are available for the full period, the convergence to the regional mean was generally stronger in the early 1990s (see the negative coefficient on the trend variable), but diminished subsequently, as revealed by the positive coefficients on the trend square variable. For Johannesburg and Lusaka, Algiers and Pretoria, for which data are only available from 2000, retail prices initially diverged slightly from the regional average, but then converged quickly thereafter.

Pooling the data and re-estimating the relationship with country by product/outlet fixed effects (see the lower part of Table 5), reinforces the general finding of significant convergence of prices within each region with stronger effects in the 1990s. These trends are also robust to the exclusion of mid-price

stores. Restricting the sample of outlets to supermarket stores where quality of products may be more consistent across cities does not alter the relationships using the pooled data (Table 5).

Product level deviations from LOP

The analysis so far has ignored potentially important differences in product market integration across product-type. Crucini et al. (2005a), for example, found that differences in cross-sectional price dispersion in EU countries are negatively related to the tradeability of the good, and positively related to the share of non-traded inputs required to produce the good. We now therefore analyse deviations from LOP according to the various aggregate product categories defined by the EIU. Our focus is primarily descriptive and we do not attempt to identify the factors that explain differences across products.

Table 6 presents the region average of the *absolute value* of the LOP deviation (i.e. $|q_{i,j,t}|$) according to the aggregate product categories. The post-2000 sample of cities (Lusaka, Pretoria and Algiers) is excluded. Declines in the values denote a convergence of city-level retail product prices towards the regional average. The final column presents the sign and significance of the trend obtained from a regression of the absolute value of LOP deviations $|q_{i,j,t}|$ on a time trend and city by product/outlet fixed effects over the period 1991 to 2008.

The table reveals substantial heterogeneity in product market integration across product type and across region. Retail prices differ most from the regional average for men's and women's clothing and beverages for cities in both regions and Fresh fruit and vegetables and Staples for SSA cities. For example, the average deviation of city retail prices from the SSA regional average was above 40 percent for all these products. This variation in retail prices across African cities reflects a multitude of factors including quality variation, tradability of product, trade costs, taxes and market structure, so it is difficult to draw any implications from the values.

Of more interest to this study are the trends in product market integration. Two key features are evident from the data. Firstly, there is evidence of widespread convergence in city level retail prices within SSA and North Africa for most of the product categories. For the sample of SSA cities, city retail prices converged on the regional mean for 14 (9 significant) of the 15 product categories in the sample of SSA cities. Convergence was strongest for Meat and fish, Personal care, Children's clothing and Health and sports goods. For the four North African cities, LOP deviations declined for 8 (6 significant) of the product categories, but rose moderately in 5 (4 significant) categories.

Secondly, deviations from LOP remain high in SSA relative to North Africa. For example, retail prices for the SSA cities deviate from the LOP by 37 to 40 percent. This is 50 to 70 percent greater than the average deviation from LOP for the North African cities.

In conclusion, bar a few exceptions, the disaggregated price data replicates the finding of increased product market integration in SSA revealed by the real exchange rates indices presented in Table 1. Regional markets appear to have become more integrated across a broad range of product categories. Nevertheless, retail prices still deviate substantially from the LOP, particularly within

the sample of SSA cities.

Relative price convergence

Deviations from the LOP provide one perspective of product market integration. In particular, they provide insight into the degree to which prices differ in absolute levels. An alternative approach to evaluating product market integration is to assess whether there has been a convergence of prices across cities towards a common set of internal relative prices (Knetter and Slaughter, 2001). In this approach it is not the absolute price difference that matters, rather what is emphasized is the similarity across countries in the across-product structure of relative prices internal to that economy. For example, we are interested in the extent to which the price of good i relative to good z differs in country j from country k. Consequently, the approach followed here is at times referred as *relative* price integration.

Relative price dispersion is measured as the variance of the city-pair relative price, $q_{i,jk,t}$ (defined in equation 4), across products i, i.e. $\text{Var}_i(q_{i,jk,t}|jk)$. Conceptually, a decline in the variance of city-pair relative prices across products represents a convergence to a common set of internal relative driven, for example, by lower trade costs. In the figures above this would be analogous to a narrowing of the distribution of LOP deviations across products.

This approach has a number of advantages over the prior approach. From a theoretical perspective, the approach is consistent with standard economic models where resource allocations are determined by internal relative prices. From an empirical perspective, the approach may identify evidence of integration that is not revealed by changes in the mean deviation from LOP. For example, trade margins or short-run misalignments of the exchange rate that have a common effect on all product prices affect the level differences in prices between the cities j and k (i.e. a deviation from LOP), but not the across-product variation in relative prices ($q_{i,jk,t}$).[12] The implication is that a decline in the mean (across product) deviation from LOP is not a necessary condition for improved product market integration. Regions may experience increases in product market integration through a convergence in relative prices, even if the mean deviation from LOP rises.

In the analysis that follows relative price dispersion at time t for city pair (j,k) is defined as the standard deviation of the log price difference ($q_{i,jk,t}$) across all products i.

$$sd_{jk,t} = sd_i(q_{i,jk,t})$$

This calculation yields 36 city-pair observations for each year using the sample of 9 African cities (including North Africa) available in all periods. In the post-2001 period where price data for 12 African cities are available, 66 city-pair standard deviation observations can be constructed per year.

Figure 2 presents trends in average relative price dispersion for city-pairs

[12] Let $q_{i,j,t} = \log P_{i,j,t} / \log P_{i,k,t}$. Further assume that $P_{i,k,t} = \theta P_{i,j,t}$ where θ is a constant reflecting a misalignment of the exchange rate or a constant transport margin. The mean log price difference will equal –log(θ), but the standard deviation across i of will equal zero: $sd(q_{i,j,t}) = sd(\log P_{i,j,t}/P_{i,k,t})) = sd(\log(1) - sd(\theta) = 0$.

according to their regional location. Each value reflects the simple average (across city-pairs in the specified region) in year t of the standard deviations $sd_{jk,t}$. The average using all city-pair observations (Intra-Africa) is presented, as is the mean across city pairs within SSA (Intra_SSA), within North Africa (Intra_NA) and between SSA and North Africa (SSA_NA). Only the 9 cities available over the full period are used to construct the figure. Figure 4 presents the equivalent trends using the sample of 12 cities available after 2001. Trends in the average relative product price dispersion amongst SADC cities are now included.

Figure 3 reveals significant declines in relative price dispersion across African cities since 1991, but the decline has largely been driven by relative price convergence within North African cities and between North African and SSA cities.[13] Consistent with the convergence in absolute prices presented earlier, most of the decline in relative price dispersion occurred during the 1990s with the trend stabilizing subsequently.[14] Similarly, relative prices are far more similar amongst the North African cities than the other cities in the sample. Looking at SSA, there is no significant change in relative price dispersion across cities within SSA during the 1990s, but there is some convergence after 1999.

These trends are also found when using the larger post-2001 sample of cities presented in Figure 4. Relative price dispersion is found to be low amongst SADC cities, but this is largely due to the very similar structure of relative prices in Johannesburg and Pretoria. There is a more pronounced downward trend for the African cities overall and SSA cities than in Figure 3. The data therefore suggest that relative prices continued to converge in the sample of African cities after 2000.

In sum, there is evidence of increased retail price integration amongst the African cities in the sample. This has taken the form of a decline in the mean deviation from LOP as well as a decline in relative price dispersion. The effects, however, are not equal across all time periods and regions. Much of the convergence took place during the early 1990s and was concentrated within North African cities. There is evidence of continued price convergence in the post-2001 period, but at a weaker pace than the early 1990s.

4 Sources of retail price convergence in African cities

The descriptive analysis so far, presents a background picture of trends in integration, but gives little insight into the various determinants of these trends.

[13] We test the significance of these trends by regressing the indicators of relative price dispersion on city-pair fixed effects and time fixed effects as follows: $sd_{jk,t} = \delta_{jk} + \sum_t \beta_t \lambda_t + \varepsilon_{j,k,t}$ These regression results corroborate the trends found in Figure 3.

[14] These trends are corroborated using the mean (across products) of the absolute value of the log difference in relative prices $|q_{i,jk,t}|$ (as used by Engel et al. (2003)) as well as the product-by-product dispersion of price levels across African cities (as in Knetter and Slaughter (2001), Engel and Rogers (2004) and Crucini et al. (2005a)).

The possible determinants are numerous. Many African economies have undergone substantial reforms since the late 1980s, in part associated with the structural adjustment programs (SAPs) implemented in these countries. By imposing similar fiscal policies and macroeconomic targets such as inflation and government deficits, the SAPS may have indirectly facilitated macroeconomic harmonization. More recently, many African regional economic communities have specified various macroeconomic convergence criteria to enhance regional integration. [15]

African economies have also liberalized trade – unilaterally and under the SAPS – and have entered into various regional trade agreements (Edwards, 2010). By lowering trade barriers and reducing trade costs, these domestic and regional policies can be expected to have enhanced product market integration.

An alternative explanation is that product market integration in Africa has been driven by common forces external to these economies. For example, reductions in price dispersion amongst Africa's major trading partners may drive a convergence in prices across African cities through the import channel. In fact, similar studies to this one based on much larger samples of cities from across the world find comparable trends in price dispersion to those amongst the African cities – price dispersion fell relatively rapidly during the first half of the 1990s, but then moderated or increased subsequently (Bergen and Glick, 2006; Parsley and Wei, 2002). Trends in price dispersion from the early 1990s therefore take on a global dimension.

In this section, we identify some of the factors that have contributed towards product market integration in Africa. To isolate the influence of internal and external forces on product market integration in African cities, we estimate a price model similar in style to the standard gravity models. The analysis is necessarily cursory and is only suggestive. Given our focus on product level measures of integration, the role of macroeconomic policies in driving integration, for example, is not dealt with. A more comprehensive analysis requires price data that covers far more African cities than is available from the EIU database.

The focus of the empirical analysis is on relative price dispersion and the standard deviation of the log price difference ($q_{i,jk,t}$) across all products i ($sd_i\left(q_{i,jk,t}\right)$) is selected as the dependent variable. Overall, this gives us between 44 and 69 city-pair observations per year (Tripoli is excluded from all estimates). The model estimated is specified as (see similar variants by Parsley

[15] For example, in accordance with its Regional Indicative Strategic Development Plan (RISDP) the Southern African Development Community (SADC) has establish the following targets to facilitate macroeconomic convergence amongst members: Inflation to reach single digit by 2008, 5% by 2012, and 3% by 2018; ratio of budget deficit to GDP not to exceed 5% by 2008 and 3% as an anchor within a band of 1% by 2012; nominal value of public and publicly guaranteed debt to be less than 60% of Gross Domestic Product by 2008 (http://www.sadc.int). Similarly, Common Market Eastern and Southern Africa (COMESA) and the East African Community (EAC) have established macroeconomic convergence criteria centered around inflation rates, budget deficits and current account deficits.

and Wei (2002), Rose and Engel (2002) and Bergin and Glick (2006)):

$$\begin{aligned} sd_i(q_{i,jk,t}) &= \alpha + \beta_1 \ln(dist_{jk}) + \beta_2 \ln(ypc_{j,t} \cdot ypc_{k,t}) + \beta_3 \ln(mfn_{j,t} + mfn_{k,t}) \\ &\quad + \beta_4 trade_{jk,t} + \beta_5 sdtar_{jk} + \beta_6 impSI_{jk,t} + \beta_7 sd(qfor)_t \\ &\quad + \beta_8 |\ln erate_{jk,t}| + \sum\nolimits_z \phi_z controls_{jk} + \lambda_t + \mu_j + \mu_k + \varepsilon_{jk,t} \end{aligned}$$

where the gravity-model based explanatory variables include log distance ($dist_{jk}$) between country pairs and the log product of GDP per capita ($ypc_j.ypc_k$).[16]

To capture the effect of domestic and regional policies, we include the log total bilateral trade (average of reporter and mirror trade) over the sum of GDP and the log of the average MFN tariff rate across city pairs (jk).[17] This data covers the period 1991 to 2007, although are missing for some countries in some years. Lower distances, rising incomes, larger bilateral trade flows and reduced MFN tariffs are expected to be associated with improved product market integration (reduced variation in relative prices).

An additional influence on relative prices is the product structure of tariff protection. Internal relative prices are expected to be more similar between countries in which product structure of tariffs is similar. To capture this effect, we include a measure of the variation in relative tariffs between city-pairs. This is calculated as the standard deviation across products of the log ratio of MFN tariffs $sdtar_{jk} = sd_i \ln\left((1+t_{i,j})/1+t_{i,k}\right)$. Unfortunately, detailed tariff schedules are not available for all countries over all years and we therefore only include the measure calculated using average tariffs using data for period 2000-02.

The impact of external forces is accounted for in various ways. To capture the effect on relative prices via imports from the rest of the world, we include a Finger-Kreinin measure of the similarity in the product composition of these imports ($impSI_{jk,t}$) for each city-pairs for each year. The rest of the world is defined as a sample of developed and developing countries (EU, US, China, India, Indonesia, Japan, Korea, Malaysia, Philippines, Thailand and Singapore) that account for upwards of 80 percent of total imports from the rest of the world.[18] A rise in the similarity of imports across country-pairs (denoted by a

[16] Trade flow data are obtained from UNComtrade and World Development Indicators. Tariff data are obtained from TRAINS and various WTO World Tariff Profiles. Distance between countries is calculated following the great circle formula using uses latitudes and longitudes of the most important city (in terms of population) or of its official capital (obtained from CEPII (http://www.cepii.fr/anglaisgraph/bdd/distances.htm). Real income per capita (2000 constant US$) data are obtained from World Development Indicators. The relative tariff measure ($sdtar_{jk}$) is calculated using simple average MFN tariffs at the 4-digit level of the SITC (Revision 2).

[17] One reason for focusing on MFN rates is that free trade agreements do not necessarily lead to greater price integration if strict rules of origin (or other barriers to regional and internal trade) remain in place. Intra-African trade flows in intermediate inputs are also low and highly concentrated, further suggesting that the MFN rates and not the regional trade agreement tariffs determine traded input prices.

[18] The similarity index is calculated as $impSI_{jk,t} = \sum_i \min(sm_{i,j,t}, sm_{i,k,t})$ where sm_{ij} and sm_{ik} are product i's shares in country j's and country k's total imports from the selected

rise in the index) is expected to reduce the variation in relative prices between the city-pairs and a negative coefficient on this variable is predicted.

As a second measure of external forces, we include a global measure of relative price dispersion ($sd(qfor)_t$) using EIU retail price data for cities in Brazil, China, USA, France, Germany, UK, Italy, India and Thailand. The indicator is calculated as the standard deviation of product prices relative to the mean product price of these countries in each year, i.e. the standard deviation of $q_{i,j,t}$ from equation 5 applied to the sample of non-African cities. According to this indicator, price dispersion (the standard deviation) fell sharply from 0.59 in 1991 to 0.49 in 1997, then rose to 0.56 in 2002 and then fell again to 0.50 by end of period. The trend in price dispersion, particularly the sharp decline in the early 1990s and subsequent increase, corresponds with that found by Bergen and Glick (2006) and Parsley and Wei (2002).

Finally, other control variables include the absolute value of log bilateral exchange rate (positive coefficient predicted), dummy variables for North Africa, SADC and rest of SSA, city fixed effects to capture time-invariant city effects and a trend variable or time fixed effects. The exchange rate and fixed effect variables to some extent capture the influence of macroeconomic policies. Macroeconomic harmonization, for example, is expected to reduce volatility of the bilateral exchange rate. Given the availability of data, the relationship is estimated over the period 1991 to 2007.

The estimation results are presented in Table 7. The first column presents the coefficients from the regression applied to all African cities. The results generally conform to expectations and corroborate findings in other studies (Engel and Rogers, 1996; Engel et al., 2003 and Bergin and Glick, 2006). International price dispersion is significantly lower for cities that are close to each other and for cities that have high real per capita incomes. The results therefore correspond closely with those of standard gravity models explaining bilateral trade flows.

Looking at the various indicators for domestic and regional policies, price dispersion is found to decrease with increased bilateral trade and lower average MFN rates imposed by each country.[19] The similarity of the tariff structure is also found to be highly significant. An additional observation is that changes in the bilateral exchange rate are associated a rise in relative price dispersion. The results imply that trade reform that increases regional trade, reduces average MFN rates, harmonizes tariff rates and stabilize exchange rates between members will contribute towards a reduced dispersion of relative prices amongst participants.

External forces have also contributed to changes in relative price dispersion amongst the African cities. The indicator of global price dispersion ($sd(qfor)_t$) is highly significant and positive, implying that relative price dispersion within the sample of African cities corresponds closely with global trends. The import

foreign trading partners. The index is calculated using mirror import data at the 4-digit level of the SITC.

[19] Parsley and Wei (2002) also find that lower tariff protection increases product market integration using a global sample of countries.

similarity index, however, is not significant, although it becomes significant once either the relative tariff variable or the global price dispersion variables are excluded. The coefficient on the trend variable is insignificantly different from zero implying that the decline in relative price dispersion for the African cities shown in Figure 3 is well explained by the variables in the model.

Also of interest is that price dispersion between the SADC cities (Johannesburg, Harare and Lusaka) is greater than is predicted on the basis of the model, whereas price dispersion within North Africa and within SSA excluding SADC is lower. Given the small sample of firms, these results are not necessarily indicative of price dispersion in other African cities.

In the remaining columns, we test the robustness of the results to changes in the sample, the inclusion of new variables for trade costs and the introduction of more fixed effects to account for unexplained heterogeneity. The second set of results, for example, includes time fixed effects and the variables for the trend and global price dispersion are consequently eliminated. The signs of the coefficients change slightly, but remain significant in all cases. In the third column, we eliminate Algiers, Pretoria and Lusaka for which price data are only available from 2000. Once again the significance of the relationships does not change.

To investigate the importance of other trade barriers on price integration in Africa, columns 4 to 6 include different measures of trade costs (number of documents, time to trade and cost of trading) drawn from the World Bank Trading on Time Indices. These variables cover the average number of documents taken by country pair (ij) to export or import, the time (days) taken to export or import and the cost to import or export (US$ per container) (see notes below Table 7 for details on their construction). No consistent set of relationships are found for the additional trade cost indicators, but the coefficients on the other explanatory variables remain largely unchanged. As expected, increases in the total number of documents required to import and export between the country-pairs appears to reduce product market integration, but unexpectedly so do higher trade costs. The time to trade has no effect on price dispersion in these results.

In the final two columns of estimates, we include city-pair fixed effects combined with a trend variable in column 7 and year fixed effects in column 8. These estimates therefore explain the within city-pair variation in relative price dispersion over time. The key results relating to MFN tariff protection, GDP per capita, global price dispersion and the exchange rate remain significant with very little change in the size of the coefficients. Bilateral trade, however, is no longer significantly associated with relative price dispersion. We now, however, find that the similarity in the structure of imports is significantly associated with price dispersion (column 7).

Overall, the main correlates of product market integration across African cities are similar to those determinants found for other regions. The relationship for the key variables is robust to changes in the sample of cities, fixed effects and inclusion of alternative trade cost measures. For some insights into the importance of each of these variables in explaining the decline in relative price

dispersion in the sample of African cities, Table 8 uses the regression coefficients from column 3 to calculate the contribution of each variable to the change in the dependent variable between 1991/94 and 2005/07. The level and change (including statistical significance) in each variable are also presented.

During the period, the standard deviation of relative prices fell from 0.69 to 0.63 (significant at 5 percent level) reflecting increased product market integration in the sample of cities. Bilateral trade as a share of GDP also rose more than three-fold (121 log points), but only contributed towards 9 percent of the decline in price dispersion. The dominant contributors towards integration were reductions in the average MFN tariff rates (42 percent), changes in global price dispersion (29 percent) and increases in the product of real GDP per capita (18 percent). The decomposition therefore indicates that price integration amongst the sample of African cities, was not entirely driven by the external environment. MFN tariff rates, which declined from an average of 23 percent in 1991-94 to 14 percent in 2005/07, made a considerable contribution.

5 Conclusion

This paper analyses regional product market integration across 13 African cities in 12 countries using product level retail price data. The paper extends the literature on African regional integration that is almost entirely based on intra-regional trade flows. We find evidence of increased product market integration in Africa. The volatility of bilateral real exchange rates between African economies has declined from the early 1990s. At the product level, retail prices for similar products have converged across the sample of African cities, although average prices still deviate substantially from the mean across all countries. For example, product prices in Lagos and Abidjan are still on average more than 25 percent higher than the average for all SSA cities for which data are available.

Increased product market integration is also revealed by a convergence in the structure of relative prices across city-pairs. This convergence is concentrated in the first half of the 1990s and has largely been driven by a convergence in relative prices amongst North African cities and between North African and SSA cities. The degree of relative (and absolute) price convergence within SSA is lower, although we do find a decline in relative price dispersion in the enlarged sample of SSA after 2001.

Many factors potentially explain these trends in product market integration. The parsimonious gravity-style estimates identify some of the important domestic, regional and global explanatory factors. Trade costs, as proxied by distance and MFN tariffs, are found to be an important determinant of price dispersion amongst African cities. The extensive reduction in MFN tariffs by the countries in the sample contributed over 40 percent of the overall decline in relative price dispersion. External forces also played a part. Global trends in price dispersion contributed around 29 percent of the overall decline in relative price dispersion in the sample of African cities. Macroeconomic policies are also likely to have influenced product integration, but given our focus on product level data, these

are not explored here.

The trends in product market integration found in this paper are only suggestive of broader trends in price integration within the African region. Broader analysis of price integration is severely constrained by a lack product price data for African economies. Consequently it is not yet possible to interrogate the impact of the various trade and monetary agreements (customs unions, free trade agreements, monetary unions) on product price integration in the continent. Little is also known about within country price dispersion, which may be particularly interesting in Africa where markets have been shown to be segmented by ethnicity of region – see the research by Aker et al. (2009). The lack of product price data over time also constrains our understanding of the price transmission mechanism from border to consumer/producer and therefore how trade reform, exchange rate volatility, global food spikes and trade-related institutions affect poverty through the production and consumption channels.

These questions (and others) require new and better price data that are available to researchers. Much policy effort has been placed on negotiating and agreeing on mechanisms to enhance integration within the SADC region. To evaluate these appropriately, better price data are required.

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TABLE 1: Average Real Exchange Rate Volatility for Sub-Saharan African Regions

	1985-96	*1997-2008*	*country pair obs.*
SSA-SSA	0.25	0.17	734
SADC-SADC	0.26	0.25	105
RSSA-RSSA	0.23	0.11	273
SACU-SACU	0.05	0.06	10
ECOWAS-ECOWAS	0.19	0.13	53
CFA-CFA	0.08	0.04	78
COMESA-COMESA	0.29	0.24	120
EAC-EAC	0.25	0.07	3

Notes: Own calculations based on World Development Indicator data. Entries give mean value of standard deviation of log change in relative prices. SADC denotes Southern African Development Community, ROW the rest of world, CFA the CFA Franc zone, ECOWAS the Economic Community of West African States, EAC the East African Community, COMESA the Common Market for Eastern and Southern Africa and RSSA denotes SSA excluding SADC. The sample includes 39 SSA countries for which at least 20 real exchange rate data observations are available from 1985-2008.

TABLE 2: African Country Data Available From the EIU Worldwide Cost of Living Survey

City	*Country*	*Region*	*Years available*	*Number of products (2008)*
ABIDJAN	Cote d'Ivoire	SSA	1990-2008	215
ALGIERS	Algeria	North Africa	2001-2008	136
CAIRO	Egypt	North Africa	1990-2008	210
CASABLANCA	Morocco	North Africa	1990-2008	214
DAKAR	Senegal	SSA	1990-2008	216
DOUALA	Cameroon	SSA	1991-2008	216
HARARE	Zimbabwe	SSA (SADC)	1990-2008	136
JOHANNESBURG	South Africa	SSA (SADC)	1990-2008	216
LAGOS	Nigeria	SSA	1990-2008	207
LUSAKA	Zambia	SSA (SADC)	2000-2008	212
NAIROBI	Kenya	SSA	1990-2008	213
PRETORIA	South Africa	SSA (SADC)	2000-2008	218
TRIPOLI	Libya	North Africa	1990-2008	193
TUNIS	Tunisia	North Africa	1990-2008	187

Source: EIU

TABLE 3: Average Product Prices in US$ for Selected Goods in SSA cities, 2000-09

Category	*Product*	*Harare*	*Johannesburg*	*Lusaka*	*Pretoria*	*Abidjan*	*Douala*	*Lagos*	*Nairobi*
		SADC				**Other SSA**			
Alcohol & beverages	Beer, local brand (1 l)	1.5	1.6	2	1.6	1.4	1.3	2.6	1.9
	Scotch whisky, six years old (700 ml)	15.6	11.1	15.9	11.4	16.6	9.9	13	24.5
	Wine, common table (1 l)	3	6	10.9	6.1	7.7	6.8	9.6	9.9
	Coca-Cola (1 l)	0.8	0.6	1.1	0.6	1.1	1.2	1	0.9
	Tea bags (25 bags)	0.5	1.9	1.1	2	2	1.5	0.7	0.5
Canned food	Peaches, canned (500 g)	1.4	0.9	2	0.9	2.4	0.9	2.6	1.9
	Sliced pineapples, canned (500 g)	1.5	0.9	1.6	0.9	1.5	1.5	2.6	0.8
	Tomatoes, canned (250 g)	0.5	0.5	1.1	0.5	1.5	0.7	0.9	0.4
Children's clothing	Boy's jacket, smart	18.3	28.2	52.3	28.2		31.1	72.1	
	Child's jeans	11.6	22.2	18.7	21.5	19.9	15.9	28.4	15.3
	Child's shoes, dresswear	10.3	55.9	20.1	55.9	51.3	31.1	37	15.2
Fresh fruit and vegetables	Apples (1 kg)	2.3	1	1	0.9	2.9	4.5	9.7	2.2
	Bananas (1 kg)	0.4	0.6	0.6	0.7	0.6	0.9	1.8	0.6
	Potatoes (2 kg)	1.7	1.5	1	1.4	1.9	2.3	3.1	1
	Tomatoes (1 kg)	0.7	0.9	0.5	0.9	3	1.1	3.2	0.6
Household supplies	Batteries (two, size D/LR20)	3.4	4.2	4.2	4.2	2.4	3.6	2.2	0.9
	Dishwashing liquid (750 ml)	2.1	1.5	1.9	1.4	3.6	1.1	2.5	1.3
	Toilet tissue (two rolls)	2	1	0.9	1	0.9	0.7	2	0.6
Meat and fish	Bacon (1 kg)	7.6	7.2	6.7	7.1	13.9	22	17.4	11.9
	Beef: ground or minced (1 kg)	4.2	4	3.8	3.9	6.4	5.3	5.5	3.5
	Chicken: fresh (1 kg)	3.3	2.7	2.8	2.6	3.8	5.6	4.6	3.7
	Beef: steak, entrecote (1 kg)	4	6.4	4.2	6.2	8.2	5.6	5.4	6.1
Men's clothing	Business suit, two piece, medium weight	172.9	327.2	177.5	327.2	292.4	462.9	365.5	197.6
	Men's shoes, business wear	47.5	115.2	64.9	115.2	116.3	235.1	229.8	41.5
Personal care	Aspirins (100 tablets)	2.6	4.9	3	4.8	18.5	6.1	6.3	3.5
	Razor blades (five pieces)	11.1	4.5	3.2	5	4	2.6	8.5	11.8
	Toothpaste with fluoride (120 g)	2.5	0.9	1.2	0.9	2.9	2.3	3	2
Staples	Butter, 500 g	3.9	2.4	1.7	2.6	3.5	3.3	4.8	4
	Flour, white (1 kg)	0.8	0.8	1.1	0.9	2.3	1.1	1.6	1
	Milk, pasteurised (1 l)	0.7	0.8	0.8	0.8	1.6	1.8	1.7	0.8
	White bread, 1 kg	0.8	0.9	0.6	0.9	3.5	2.6	2	0.6
Tobacco	Cigarettes, local brand (pack of 20)	0.5	1.8	1.1	1.8	1.2	1.9	1.2	1.1
Women's clothing	Dress, ready to wear, daytime	41.7	216.6	81.9	216.6	118.9	206.2	162.9	63
	Women's shoes, town	24.3	70.2	51.3	70.2	57.2	86.4	214.5	30.6

Source: EIU

TABLE 4: Average (Across Goods) Deviation From LOP for African Cities

	1991-94	*1995-99*	*2001-04*	*2005-08*
Relative to average SSA price				
Abidjan	0.418	0.410	0.352	0.272
Dakar	0.320	0.124	0.073	0.036
Douala	0.316	0.132	0.086	0.111
Harare	-0.575	-0.498	-0.348	-0.342
Johannesburg	-0.178	-0.200	-0.164	-0.129
Lagos	0.092	0.185	0.384	0.267
Lusaka			-0.293	-0.084
Nairobi	-0.377	-0.144	-0.122	-0.191
Pretoria			-0.178	-0.124
Relative to average North Africa price				
Algiers			0.216	0.196
Cairo	0.171	0.135	-0.001	-0.096
Casablanca	-0.051	-0.05	0.028	0.129
Tunis	-0.09	-0.074	-0.128	-0.187

Note: Pretoria prices are excluded when calculating the average log price for SSA region.

TABLE 5: Trend in Absolute Value of Deviation From Regional LOP, by City

	Trend	*Trend^2*	*Obs*	*F*	*Adj. R2*
Sub-Saharan Africa					
Abidjan	-0.015***	0.000	3649	89	0.55
Dakar	-0.033***	0.001***	3676	166	0.54
Douala	-0.024***	0.001***	3627	71	0.59
Harare	-0.026***	0.002***	3361	20	0.32
Johannesburg	0.011***	-0.000***	3686	9.3	0.47
Lagos	0.002	-0.000*	3506	15	0.36
Lusaka	0.037***	-0.006***	1670	74	0.51
Nairobi	-0.048***	0.002***	3640	172	0.55
Pretoria	-0.042***	0.003***	1851	25	0.6
North Africa					
Algiers	0.068***	-0.007***	803	31	0.8
Cairo	-0.007**	0.000	3296	12	0.44
Casablanca	-0.019***	0.001***	3554	43	0.33
Tunis	-0.012***	0.001***	3195	18	0.55
Pooled, cities in all periods					
Sub-Saharan Africa					
All outlets	-0.0194***	0.0007***	25145	240	0.19
Supermarkets only	-0.0195***	0.0008***	11644	111	0.18
North Africa					
All outlets	-0.0135***	0.0005***	10045	57	0.32
Supermarkets only	-0.0113***	0.0005***	4562	22	0.3

Notes: Each city regression includes product/outlet fixed effects. The pooled estimates include city by product/outlet fixed effects and only include cities available in all periods. Estimates for each country include all types of retail outlets. *, ** and *** denote significance at the 10 per cent, 5 per cent and 1 per cent level, respectively.

TABLE 6: Average of Absolute Value of Deviation From LOP, by Product Group

	1991-94	**1995-99**	**2000-04**	**2005-08**	**Change 91/4 to 05/08**	**Significance**
Sub-Saharan Africa						
Alcohol	0.38	0.32	0.33	0.32	-0.06	(-) ***
Beverages	0.48	0.46	0.43	0.40	-0.07	(-) ***
Canned food	0.40	0.44	0.39	0.35	-0.04	
Car prices	0.30	0.26	0.23	0.23	-0.06	(-) ***
Children's clothing	0.49	0.38	0.41	0.33	-0.16	(-) ***
Fresh fruit and vegetables	0.52	0.45	0.51	0.49	-0.02	
Health and sports	0.45	0.54	0.38	0.27	-0.17	(-) ***
Household supplies	0.44	0.40	0.41	0.37	-0.07	(-) ***
Meat and fish	0.53	0.37	0.33	0.28	-0.25	(-) ***
Men's clothing	0.53	0.42	0.54	0.40	-0.13	(-) *
Personal care	0.57	0.48	0.42	0.40	-0.17	(-) ***
Recreation	0.28	0.24	0.26	0.30	0.01	
Staples	0.49	0.43	0.42	0.43	-0.06	(-) ***
Tobacco	0.47	0.33	0.38	0.38	-0.09	
Women's clothing	0.49	0.45	0.53	0.43	-0.05	
All products	0.48	0.40	0.40	0.37	-0.11	(-) ***
North Africa						
Alcohol	0.34	0.18	0.27	0.29	-0.06	
Beverages	0.37	0.34	0.33	0.34	-0.04	
Canned food	0.15	0.22	0.15	0.14	-0.01	(-) ***
Car prices	0.32	0.29	0.22	0.11	-0.21	(-) ***
Children's clothing	0.31	0.23	0.21	0.18	-0.13	(-) ***
Fresh fruit and vegetables	0.36	0.22	0.20	0.20	-0.16	(-) ***
Health and sports	0.36	0.24	0.32	0.43	0.06	(+) ***
Household supplies	0.25	0.22	0.22	0.25	0.00	
Meat and fish	0.15	0.16	0.16	0.18	0.03	(+) ***
Men's clothing	0.35	0.36	0.40	0.42	0.07	(+) ***
Personal care	0.27	0.24	0.20	0.28	0.01	
Recreation	0.22	0.23	0.24	0.26	0.04	(+) ***
Staples	0.33	0.26	0.23	0.23	-0.10	(-) ***
Tobacco	0.32	0.24	0.21	0.24	-0.08	(-) ***
Women's clothing	0.32	0.34	0.34	0.32	0.00	
All products	0.29	0.24	0.23	0.24	-0.05	(-) ***

Notes:
Only includes cities available in all periods. Tripoli is excluded. Final column denotes sign and level of significance of the trend coefficient in a regression of the absolute value of LOP deviation on a time trend and city by product/outlet fixed effects. *, ** and *** denote significance at the 10 per cent, 5 per cent and 1 per cent level, respectively.

TABLE 7: Regression With Standard Deviation Across Products as Dependent Variable

	All cities		Excl. post 2001 cities	Trading across borders (All cities)			Within city-pair variation (All cities)	
				Documents	Cost	Time		
	1	2	3	4	5	6	7	8
log Distance	0.023**	0.026**	0.032**	0.021**	0.03***	0.025**		
	(0.009)	(0.009)	(0.011)	(0.009)	(0.009)	(0.009)		
log Bilateral trade	-0.003**	-0.003**	-0.005**	-0.004**	-0.002	-0.003**	0.002	0.003
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.003)	(0.003)
log (1+Tariff)	0.305**	0.205*	0.313**	0.302**	0.316**	0.306**	0.297**	0.197**
	(0.108)	(0.110)	(0.109)	(0.108)	(0.105)	(0.108)	(0.097)	(0.099)
sd Relative tariff	0.575**	0.615***	0.195	0.64***	0.547**	0.525**		
	(0.186)	(0.187)	(0.209)	(0.187)	(0.185)	(0.196)		
Global price dispersion	0.523***		0.471***	0.52***	0.521***	0.522***	0.508***	
	(0.098)		(0.103)	(0.098)	(0.097)	(0.098)	(0.093)	
Import similarity index	-0.060	-0.016	-0.078	-0.065	-0.070	-0.064	-0.116**	-0.061
	(0.044)	(0.044)	(0.049)	(0.044)	(0.043)	(0.044)	(0.048)	(0.050)
log Product real	-0.054**	-0.048**	-0.04*	-0.056**	-0.046**	-0.053**	-0.048**	-0.044*
GDP per capita	(0.022)	(0.024)	(0.024)	(0.022)	(0.022)	(0.022)	(0.022)	(0.023)
Bilateral exchange	0.005**	0.006**	0.006**	0.005**	0.008***	0.005**	0.008**	0.01**
rate difference	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)
Trend	0.000		0.001	0.001	0.000	0.000	0.000	
	(0.001)		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	
SADC	0.058**	0.058**	0.08**	0.055**	0.034	0.051**		
	(0.020)	(0.020)	(0.036)	(0.020)	(0.022)	(0.022)		
North Africa	-0.055***	-0.056***	-0.066***	-0.053***	-0.097***	-0.06***		
	(0.015)	(0.015)	(0.017)	(0.015)	(0.019)	(0.016)		
RSSA	0.007	0.005	-0.005	0.007	0.031**	0.010		
	(0.011)	(0.010)	(0.016)	(0.011)	(0.012)	(0.012)		
log Documents to trade				0.426**				
				(0.186)				
log Time to trade						-0.059		
						(0.074)		
log Cost of trading					-0.298***			
					(0.081)			
N	895	895	738	895	895	895	895	895
F	37.4	25.6	39.2	36.6	36.4	35.6	29.9	28.4
Adj R2	0.475	0.498	0.489	0.477	0.487	0.476	0.591	0.613
City fixed effects	y	y	y	y	y	y		
Year fixed effects	n	y	n	n	n	n	n	y
City pair fixed effects							y	y

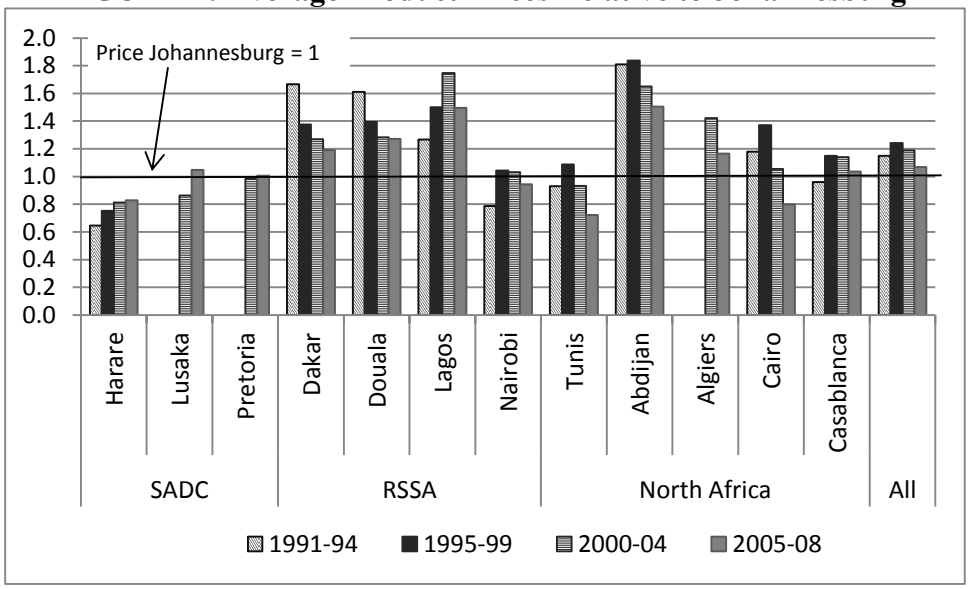
Notes: Robust standard errors are in parentheses. *, ** and *** denote significance at the 10 per cent, 5 per cent and 1 per cent level, respectively. The variable for the number of documents to trade (column 4) is calculated as $\ln((xd_j+xd_k+md_j+md_k)/4))$ where *xd* refers to days required to export and *md* refers to days required to import. The average cost (US dollars per container – column 5) and days taken to export and import (column 6) are calculated in a similar way. Tripoli is not included in any of the estimates.

TABLE 8: Contribution to Change in Price Dispersion

	Average level			*Contribution to change in price dispersion*
	1991-94	*2005-07*	*Change*	*%*
Dependent variable	0.69	0.63	-0.06*	
log Distance	8.29	8.20	-0.09	0.05
log Bilateral trade	-9.17	-7.96	1.21*	0.09
log (1+Tariff)	0.23	0.14	-0.09*	0.42
sd Relative tariff	0.17	0.16	-0.01	0.02
Global price dispersion	0.56	0.52	-0.04*	0.29
Import similarity index	0.38	0.44	0.07	0.08
log Product real GDP per capita	13.48	13.76	0.29*	0.18
Bilateral exchange rate difference	2.56	2.87	0.30	-0.03
Trend				-0.11

Notes: Calculations based on the regression results in column 3 of Table 7 that exclude the post-2000 sample of cities. * signifies that the change in the explanatory variable is significant at the 5 percent level. The change in log distance and the sd of relative tariffs reflect changes in the composition of cities. Douala, for example lacks data on tariffs for 1991-92.

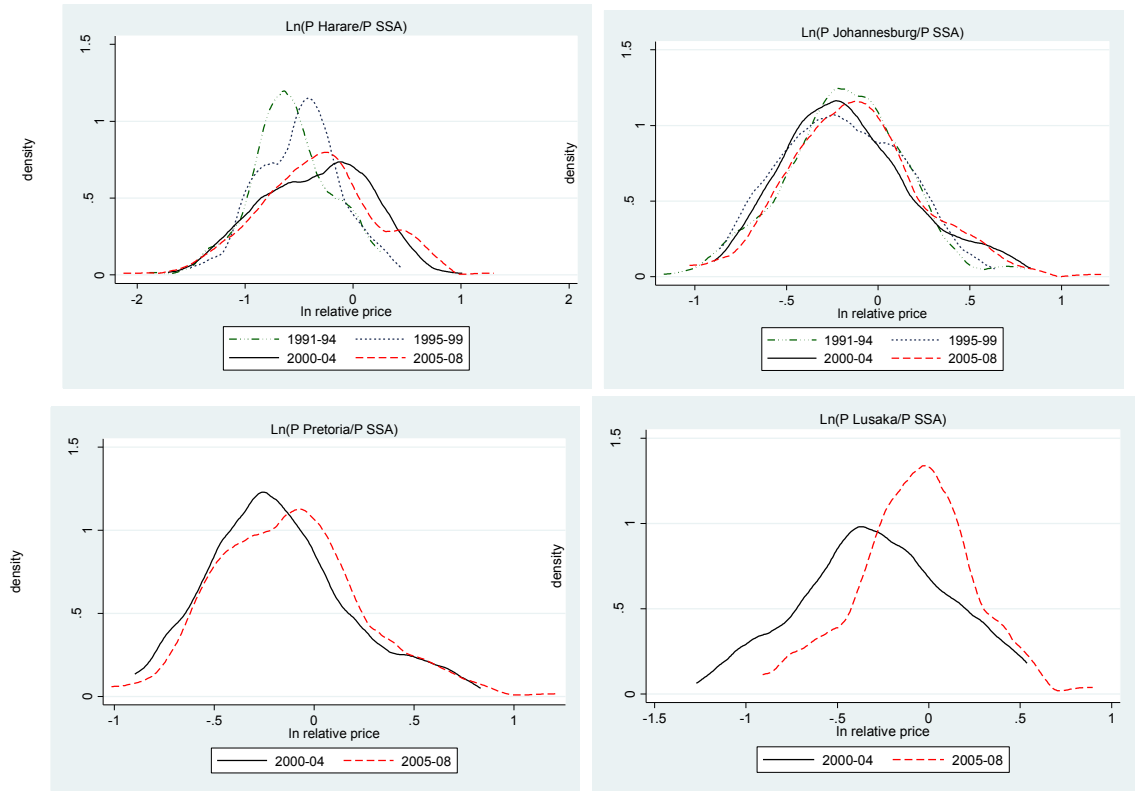
FIGURE 1: Average Product Prices Relative to Johannesburg



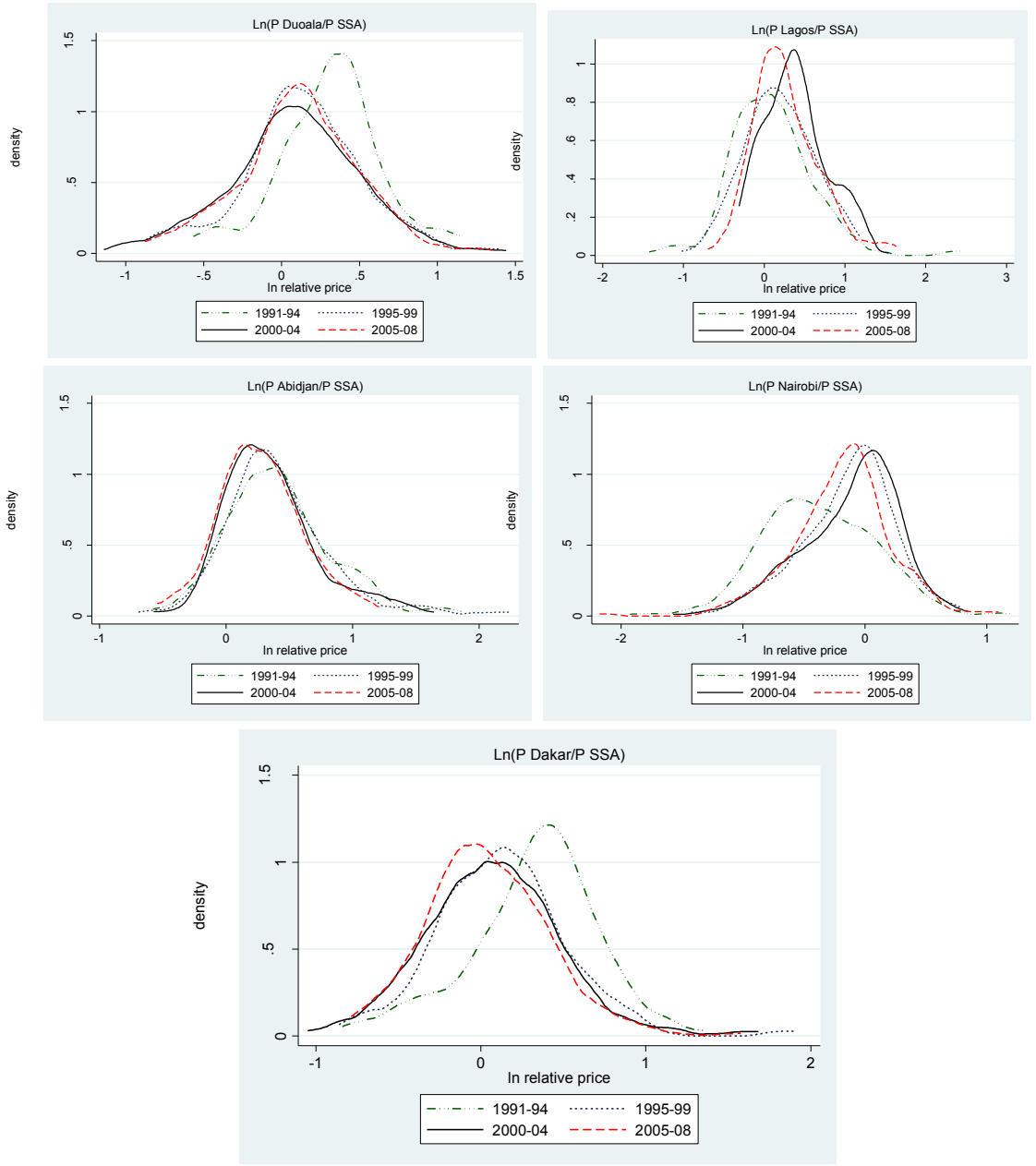
Notes:
Own calculation using EIU City product price data. Excludes non-traded services, but includes all retail outlets. The values represent the exponent of the average annual log product price in each city relative to Johannesburg over each period. Only cities available over the full sample period are included in the final category for all cities.

FIGURE 2: Distributions of LOP Deviations: Price Relative to Average in SSA

a. SADC countries

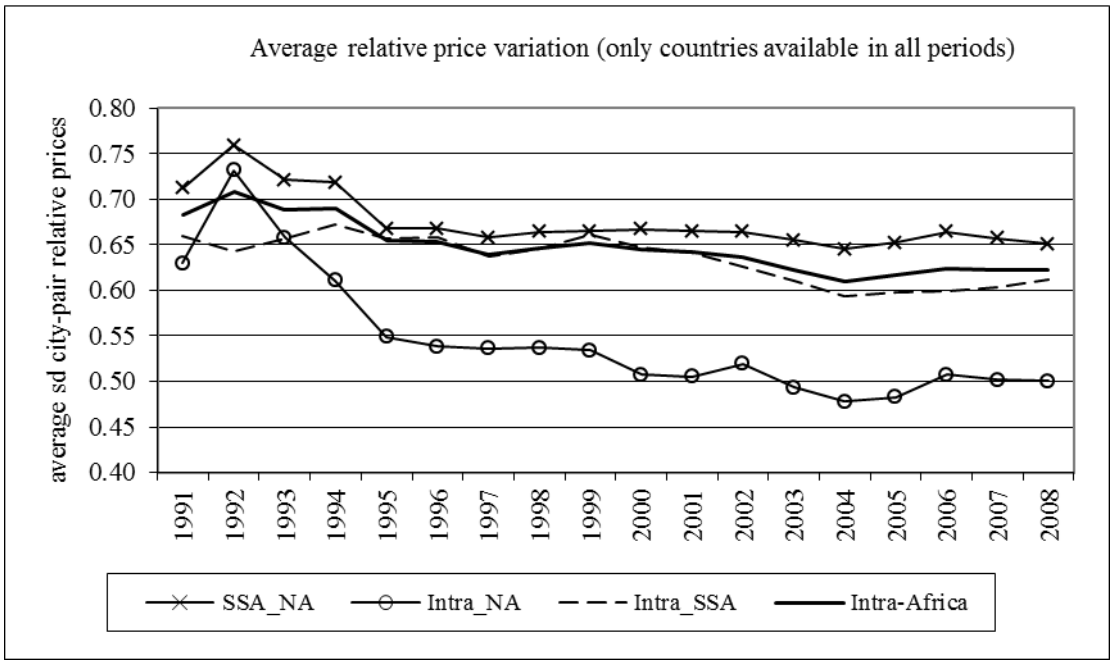


b. Rest of SSA



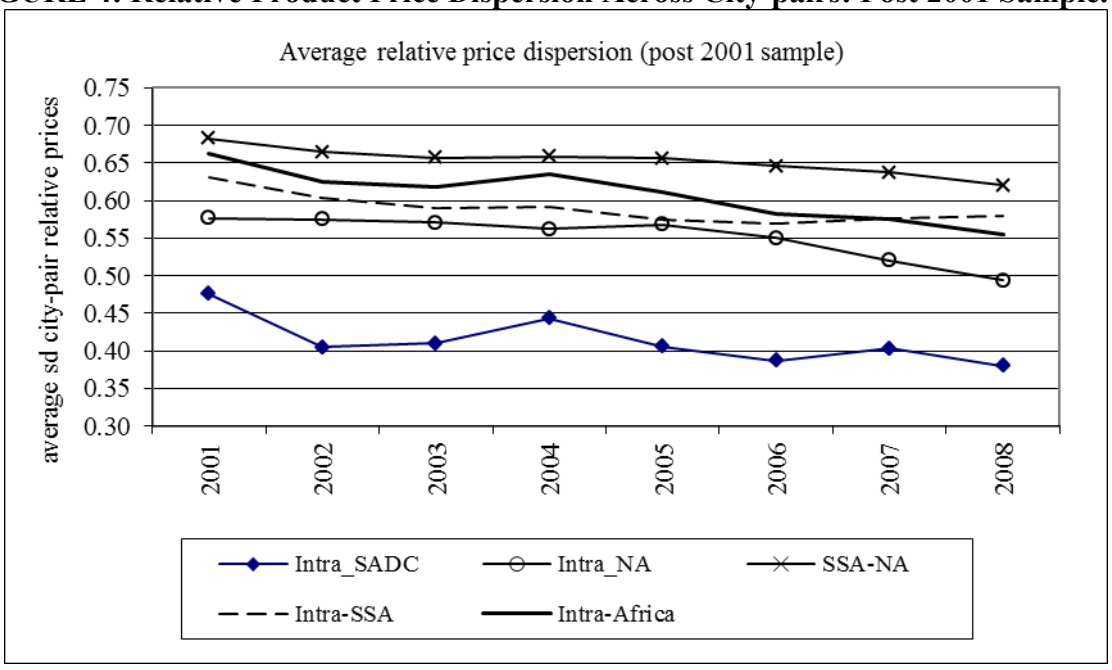
Notes:
The average relative price for each period is presented. Pretoria prices are excluded when calculating the average log price for SSA region (the denominator).

FIGURE 3: Relative Product Price Dispersion Across City-pairs: Cities Available in All Periods



Notes:
Excludes Tripoli and Harare. Only includes cities for which price data are available in all periods.

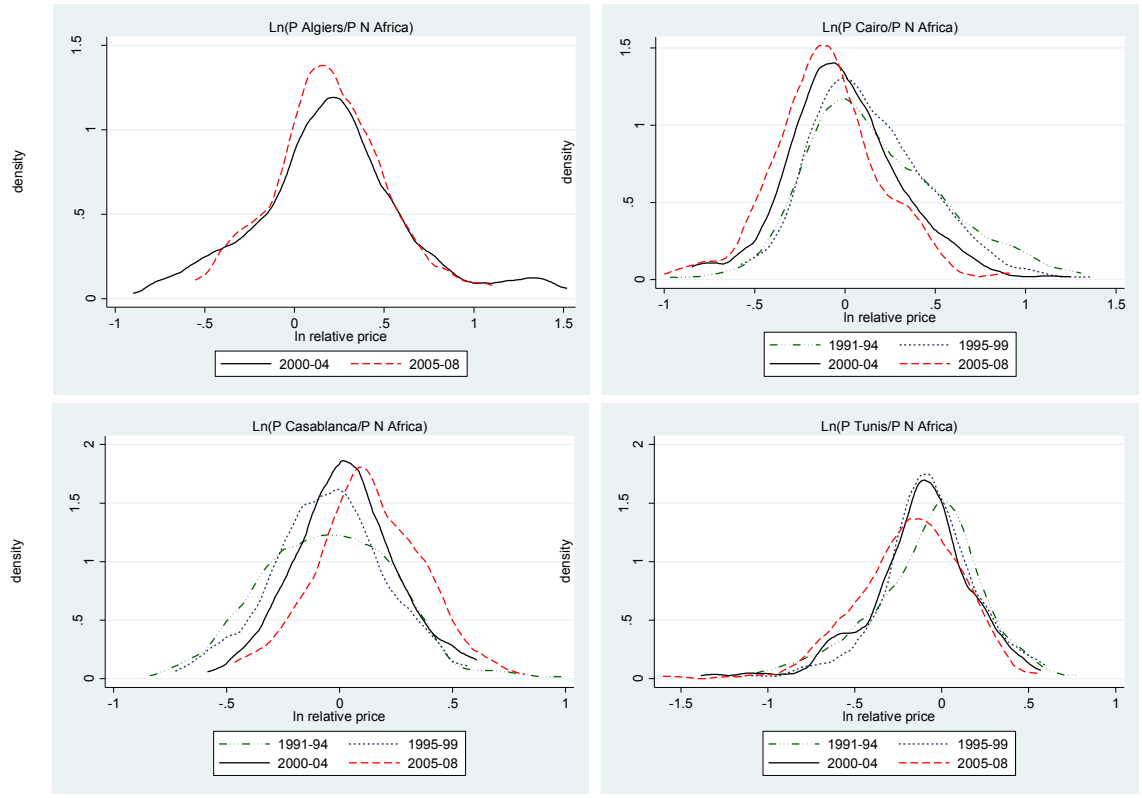
FIGURE 4: Relative Product Price Dispersion Across City-pairs: Post 2001 Sample.



Note:
Sample consists of all African cities available excluding Tripoli and Harare.

Appendix

FIGURE A: Distributions of LOP Deviations: Price Relative to Average in North Africa



Notes:
The average relative price for each period is presented. Pretoria prices are excluded when calculating the average log price for SSA region (the denominator). Tripoli (Libya) is excluded.